ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 55.] JULY. [1891.

CC.—GOLD COAST BOTANICAL STATION.

The success which has attended the efforts made by Sir Alfred Moloney to establish a Botanical Station at Lagos [noted in the *Kew Bulletin*, 1888, p. 149; 1889, p. 69; 1890, p. 162; and 1891, p. 46] has led to efforts being made to establish stations at others of our West African Settlements. The most successful, so far, of these latter is undoubtedly the Botanical Station in course of being established at Aburi, a hill village in the Colony of the Gold Coast.

The history of the establishment of this station is given in the following correspondence. The station is in charge of Mr. William Crowther, a gardener trained at Kew, who was appointed in January 1890. His Excellency Sir W. Brandford Griffith, K.C.M.G., the Governor, takes a deep personal interest in the work of the station, and the results so far attained are very promising.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

And to be purchased, either directly or through any Bookseller, from
EYRE AND SPOTTISWOODE, East Harding Street, Fleet Street, E.C., and
32, Abingdon Street, Westminster, S.W.; or
JOHN MENZIES & Co., 12, Hanover Street, Edinburgh, and
88 and 90, West Nile Street, Glasgow; or
HODGES, FIGGIS, & Co., 104, Grafton Street, Dublin.

1891.

Price Twopence.

GOVERNOR OF GOLD COAST to COLONIAL OFFICE.

MY LORD, Accra, 28th August 1888.

IN my Despatch No. 53, of the 2nd of March last, in section 11, it was stated: "At Aburi, which has mountain slopes of southern "aspect and a fertile soil admirably suited for coffee and cocoa, the "former of which is already cultivated to some extent, owing to the "example of the members of the Basel Mission stationed there, I also "emphasised the advantages of agriculture to the Africans of the place, "and endeavoured specially to stimulate the local native sluggishness "in which some leaven of industry has begun to show itself. I had "already ordered a space of about three acres to be cleared of bush, "with a view to the commencement of and concentration of the expen- "diture upon gardens at out-stations on the cultivation of a model "farm, as well as with a view of improving the sanitary surroundings "of this house; and I am hopeful that I may see my way at no distant "date to place before you a definite scheme on the subject." In my Despatch No. 232, of the 30th of June, I referred to the subject in paragraph 19, and stated that I should presently do myself the honour of submitting to your Lordship a scheme for the formation of an agricultural farm at Aburi under the charge of a fit and competent man from Jamaica or Trinidad.

I have now the honour of bringing the proposed scheme more particularly under your Lordship's notice. The "Bulletin of Miscellaneous Information" for June, issued by the Director of the Royal Gardens at Kew, refers to this Colony in the following extract from page 150:— "The principal West African Colonies are the Gambia, Sierra Leone, "Gold Coast, and Lagos. The extent of these Colonies may be estimated "from the fact that the coast line of the Gold Coast Colony alone is "350 miles, and that the total area of the British Protectorate is from "24,000 to 30,000 square miles. The staple products of this Colony "are palm oil and palm kernels, but among other exports are copra "(from the cocoa-nut palm), guinea grains, gum copal, camwood, and "beniseed. If once the Natives inhabiting magnificent lands in this "Colony were taught to cultivate economic plants in a systematic "manner for purposes of export, the material wealth of the Gold Coast "might be enormously increased."

It was mainly with the view of teaching the Natives to cultivate economic plants in a systematic manner for purposes of export that I have contemplated for some time the establishment of an agricultural and botanical farm and garden, where valuable plants could be raised and distributed in large numbers to the people in the neighbourhood in the first instance, and afterwards sent further into the country by pupils whom I contemplate taking from the schools when willing to give their attention to industrial pursuits. By their labour and agency, when sufficiently educated for the purpose, additional farms or gardens could be started, and by these means the people generally would become acquainted with the fact that other products than those indigenous to the country had been introduced into it, were thriving and would be remunerative, and thus observing the advantage to be gained by their propagation, would be disposed to cultivate them. By this mode of procedure I trust that in time it will be possible to raise sufficient quantities of new productions which may, in the not too distant future, add considerably to the value of the exports from the Colony.

With these objects in view, when passing through Aburi in March last, I instructed the Surveyor-General that he was to have surveyed

and marked out a large additional tract of land adjoining that around the house at Aburi, which is already the property of the Government, for acquisition under the Public Lands Ordinance, No. 8, of 1876. The hill slopes and soil of Aburi are admirably suited for the cultivation of cocoa, coffee, cloves, cinnamon, nutmegs, vanilla, and other useful products. Cocoa and coffee, as previously stated, are already grown to some little extent by a few of the Natives, who have followed the practical example set to them by the Basel Missionaries at Aburi and Akropong.

A sum of 300*l.* has been inserted in the estimates for 1889 for an agricultural and botanical garden at Aburi.

* * * * * *

I have purposely put the initial expenditure of the scheme at a low figure as it must be somewhat in the nature of an experimental measure, the success of which will largely depend upon the energies of the officer selected as superintendent, but I have every confidence that those who direct the Botanical Gardens at Kew, Mr. Morris especially, who has been out in Jamaica, would be willing to afford this Colony the necessary assistance to ensure the choice of a man who would not fail to bring about that success. Furthermore the climate of Aburi is comparatively healthy.

* * * * * *

I have, &c.
(Signed) W. Brandford Griffith,
Governor.

The Right Hon. Lord Kutsford, G.C.M.G.,
&c. &c. &c.

Royal Gardens, Kew, to Colonial Office.

Sir, Royal Gardens, Kew, October 12, 1888.

I am desired by Mr. Thiselton Dyer to acknowledge the receipt of your letter of the 27th September on the subject of a proposal to establish a Botanical Garden at Aburi, on the Gold Coast.

The details of the scheme set forth in the Despatch of Sir Brandford Griffith of the 28th August appear to have been carefully and judiciously planned; and it is evident that the proposed Botanical Garden, if successfully worked, would prove of considerable value in stimulating the attention of Natives to the cultivation of economic plants, and in disseminating useful information respecting them.

The future prosperity of the West African Settlements would appear to depend very much on how far the natives inhabiting rich and fertile lands not far from the Coast can be led to cultivate certain plants, and prepare the produce so as to give rise to commercial intercourse with other countries. The gathering and shipping of mere forest products have already shown signs either of becoming exhausted or of becoming depreciated in the world's markets.

Sir Brandford Griffith has fully grasped the practical aspect sought to be given to the proposed experimental garden and nursery at Aburi. It is to be established, he says, "mainly with the view of teaching the "Natives to cultivate economic plants in a systematic manner for "purposes of export." Steps are also to be taken to train pupils in planting pursuits, and generally diffuse a knowledge of practical horticulture amongst the people.

As regards the site of the proposed garden, it is always desirable to place such an institution as near as possible to the seat of the Government, and easily accessible to a large section of the population. Doubtless these points have been duly considered in the selection of Aburi. The soil is stated to be good and the locality fairly healthy.

* * * * * *

I have, &c.

The Hon. R. H. Meade, C.B. (Signed) D. Morris.

Sir W. Brandford Griffith to Royal Gardens, Kew.

My dear Sir, Aburi House, April 5, 1890.

I beg to acknowledge the receipt of, and to thank you for, your kind letter of the 25th February, in which you are good enough to inform me of the receipt of the telegram I sent from Bathurst on my way to Accra, and the steps which Mr. Thiselton Dyer and yourself have so kindly taken to meet my request.

Mr. Crowther arrived here on the 16th ultimo, and I have much pleasure in stating that I owe you many thanks for having selected for me an officer who appears, from the short acquaintance I have had with him, to be possessed of all the good qualities I could wish for in a man selected to fill the appointment he now holds.

You will be interested to learn that I left Accra on the 1st March, for this place, having come up for the purpose of pushing on the work of clearing the forest and bush on the farm preparatory to Mr. Crowther's arrival. We have now nearly 8 acres ready for sowing and planting, seven of which have been recovered from the forest and bush and put in capital order, and the Curator has already sown several thousand coffee and cocoa seeds as well as those of other kinds in smaller quantities. I have also written to the Governors of Trinidad, British Guiana, and Jamaica, requesting their kind offices in aiding my work by sending to me plants and seedlings in accordance with a long list transmitted to them. I should mention here that some years ago a Wardian case, containing plants, was sent to me at Lagos from Trinidad through Messrs. Elder, Dempster, & Co., Liverpool, and the plants did not suffer at all from the long voyage.

I note what you state with regard to the Egyptian cotton, and I have given Mr. Crowther minute and special instructions that it should be placed on record that when any is harvested specimens are to be sent to me for the purpose of being forwarded to Kew for your information, and for examination by an expert as you so kindly offer shall be done.

The Natives for many miles round are already evincing much interest in this experiment on the part of my Government, and I feel confident that the good beginning which has been made will be carried on until the useful and beneficial aim for which this centre has been established, is accomplished.

With kind regards to you, and to Mr. Thiselton Dyer,

Believe me, &c.

D. Morris, Esq., (Signed) W. Brandford Griffith,
Royal Gardens, Kew. Governor.

CURATOR, BOTANICAL STATION, ABURI, to ROYAL GARDENS, KEW.

SIR, Botanical Station, Aburi, July 1890.

I HAVE the honour to acknowledge the receipt of a packet of seeds, including three species of Eucalyptus, together with notes upon them. I also beg to acknowledge receipt of a box of Palm seeds (*Bactris sp.* and *Livistona sp.*) and a box of Mahogany seeds, all of which were received in good condition.

In regard to my work at Aburi, I would beg to inform you that most of the seeds received from the Royal Gardens, Kew, have been sown. Many of them have germinated and are growing well, notably the two varieties of Egyptian cotton, which are just now coming into flower. They were sown at the commencement of the rainy season, and have grown most luxuriantly. [A report upon this will be found in the *Kew Bulletin* for March, 1891.]

The plants received from Kew are all growing satisfactorily, and seem to be adapting themselves to the climate.

The Governor, Sir W. Brandford Griffith, who takes a great interest in the working of the garden, has supplied many valuable seeds, including Cinchona, Casuarina, Tobacco, Indigo, Jute, Cotton, Liberian Coffee, Theobroma Cacao, 400 Cocoanuts, &c. His Excellency also expects a lot of seeds and plants from the West Indies shortly.

I think Aburi is a very proper place for a Botanical Station. It is at an elevation of 1,400 feet, and the vegetation around is very luxuriant. Most years there is a copious rainfall, extending, more or less, from March to November, and the temperature seldom exceeds 87° or 88° in the shade. The soil also is very good, consisting chiefly of vegetable matter, and there is a spring of fresh water within about a quarter of a mile of the garden.

I have, &c.

D. Morris, Esq., (Signed) W. CROWTHER.
Royal Gardens, Kew.

COLONIAL OFFICE to ROYAL GARDENS, KEW.

SIR, Downing Street, 12th June 1891.

I AM directed by the Secretary of State for the Colonies to transmit to you, for your information, a copy of a Despatch from the Governor of the Gold Coast relative to the Botanical Station at Aburi.

I am, &c.

The Director of the (Signed) ROBERT G. W. HERBERT.
Royal Gardens, Kew.

GOVERNOR OF THE GOLD COAST to COLONIAL OFFICE.

Government House, Christiansborg Castle,

MY LORD, Accra, 6th May 1891.

I HAVE the honour to report that I left Christiansborg at 8.25 p.m. on the 2nd instant, and arrived at Aburi House, for the purpose of inspecting the Botanical Station, at 11.25 p.m. the same evening. I halted at Timan for an hour and proceeded for about 10

miles of the way in a hand-cart. The road was good, and I might have been drawn the whole way in the cart had I been so minded. Returning yesterday, I left Aburi at 12.35 p.m., and reached Christiansborg at 6.35, thus taking only six hours *en route* and travelling 16 miles in a hand-cart.

2. I found the station in excellent order, which left nothing to be desired on the part of the Curator, Mr. Crowther, so far as I can see. When I arrived at Aburi in March 1890, I found one acre of land clear of bush and forest trees. I cleared seven acres myself before, and shortly after, the arrival of Mr. Crowther in the same month; since then Mr. Crowther has cleared 15 acres, two acres of which consist of garden beds for seedlings. He has constructed five workmanlike potting-sheds in good positions, and the 13 labourers whom I brought down from Monrovia as a permanent labour gang have for the most part turned out well and built themselves neat and comfortable huts, to which are attached patches of garden land which they work for themselves. The rainfall for the year Mr. Crowther has been at Aburi was 60 inches, but heavy mists prevail in the early morning throughout the year, which are most helpful to plants. He has enjoyed excellent health the whole time. He has hardly lost any of all the different kinds of valuable economic plants which have been received from various quarters. Liberian coffee has grown very well; there are some 7½ acres of it planted out, 3½ permanently and the rest for transplanting purposes. The annatto dye plants, some six feet high, are flourishing. The different fruit plants are very promising. The Egyptian cotton grew well. Since the local publication of the correspondence with regard to this article, applications have been received for supplies of seed from Messrs. Bannerman and Fearon, two influential native proprietors, which I regard as a hopeful sign. The beefwood (*Casuarina equisetifolia*) trees which have been planted are growing well. The cinchona seed received from Paris has failed. The leaf of the tobacco grown is splendid, but it is a question whether the climate will admit of its curing by other than artificial means. There is no native demand as yet for it, but Mr. Leach, the agent of Messrs. Swanzy at Akuse, has bought seeds both of tobacco and cotton. The cultivation of European vegetables has met with the greatest success. The lettuce I tasted there was as good as that of the best European gardens. I propose to make permanent arrangements for the transport to Accra of green food and vegetables free of cost to the officers, looking to their importance as a means of the promotion of health. The different varieties of ornamental plants have grown well, as have also kola nuts and shea butter trees, indigenous to the country. The soil has proved to be of the richest, and on the sides of the hills is of good depth. I was glad to observe patches of clearing on the mountain slopes facing the Basel Mission Station of Abokobi, at the foot of the range. Along the road to Accra also I saw much more evidence of country gardening than has ever been attempted before. I am told that the natives come and look on at the operations at Aburi with interest, and when the results of the agriculture and arboriculture which are being pursued become more patent than they even now are, the model which is thus put before them cannot, I should think, fail to impart to them the desired industrial stimulus; this may take time to effect, but I doubt not as to its ultimate success, if the management of the station should proceed as well as it has commenced. A native has recently purchased 500 Liberian coffee plants at 1½*d.* each; Chief Atta Fuah of Western Akim has applied for cocoa plants, and other small sales have also been made. During my visit to the place, of

two days and a half, I inspected the village of Aburi, which I found clean and in good order, and I also went over a patch of land of some 14 acres belonging to the Rev. Mr. Clarke, a native minister, which I think should be acquired by the Government and added to the Government property. I will submit the question to the Legislative Council at its next sitting. The cost will be very trifling. Lieutenant-Colonel Cash and Assistant-Inspector O'Donnell, of the constabulary, with Dr. Gunn in attendance upon them, were at Aburi during my visit, convalescing from illness and, I am glad to state, recovering rapidly.

3. The term of service of Mr. Crowther, the Curator, expired on the 14th ultimo, and I had brought Mr. Eyre with me to Aburi to relieve him, but when I found on arrival that Mr. Crowther was in such good health, and as he cheerfully expressed his willingness to comply with a suggestion which I made for his consideration that, looking to the large amount of valuable Government property which he had so far successfully brought to a critical stage, he should remain in the Colony a little longer, before going on leave, to superintend the transplanting from the seedling beds of the different young plants with the advent of the rainy season and initiate Mr. Eyre into his duties, I was glad to avail myself of his offer. Mr. Eyre's term of residential service also expired on the 5th instant, but he does not desire to return to England, and is only too glad to have the opportunity of continuing his service in the healthy climate of Aburi, whilst engaged upon work which is congenial to him, and of which he has had previous experience when employed upon plantations in Fiji. I am of opinion, moreover, that it will be of advantage to the public service that he should be allowed to do so, as there is no other officer who is available for the service. I apprehend that, in the circumstances, his offer will entitle him to the usual extra leave under paragraph 424 of the Colonial Regulations.

I have, &c.

(Signed) W. Brandford Griffith,
Governor.

The Right Hon.
Lord Knutsford, G.C.M.G.,
&c. &c. &c.

CCI.—BAHAMAS INDUSTRIES.

One of the most interesting circumstances connected with the economic development of the Bahamas Islands is the great attention devoted within the last few years to the planting of Sisal hemp (*Agave rigida* var. *sisalana*). This subject has already been discussed in the *Kew Bulletin*, 1889, p. 57; 1889, p. 254; and 1890, p. 158. In a recent report in the Blue Book for the year 1890, Sir Ambrose Shea, K.C.M.G., the Governor of the Bahamas, supplies the following particulars respecting this and other agricultural industries connected with the colony:—

Agriculture.

Apart from the fibre cultivation agriculture is confined chiefly to pine-apples. The people raise maize and sweet potatoes for their own use, and their maintenance is much assisted by these crops. Cotton shows an increase, being 1,593*l.* in value compared with 1,074*l.* in 1889.

There is no reason why this business should not be extensively prosecuted, as most of the islands are well adapted for its cultivation. It is hoped that the presence of strangers now coming in to pursue the fibre industry will act on cotton productions, to the advantages of which their attention cannot fail to be directed. It is quite possible that, in time, cotton may be found only second to the fibre in the category of exports from the colony. The pine-apple crop realised 49,795*l.*, as compared with 25,558*l.* in 1889. Of canned pine-apples there were exported 26,789 cases, valued at 6,126*l.*, and in 1889 the export was 21,683 cases, with a value of 4,500*l.* In oranges there was an export of 3,961*l.*, the output of 1889 having been 3,040*l.* Careless culture and a reckless mode of shipping, very often in bulk in vessels' holds, must militate against the success of the orange growers. There are advantages for the cultivation of oranges in these islands not known in Florida, as we are proof against frost, which often visits that country. This branch of employment may also be favourably affected when men of enterprise from outside, appreciating the opportunity, use it with energy and the application of well-ordered methods of packing and shipping.

Fibre Cultivation.

Steady progress continues to be made in this industry, with increasing faith in its value and permanence. A report of the cultivation to the present time has been prepared by order of the Government, which, though strictly accurate, would not convey true impressions to those at a distance.

The report speaks of 4,100 acres being already planted with 2,500,000 of plants, but it states that there are also 1,300,000 plants in nurseries, which, being in course of growth, adds 50 per cent. to the active cultivation, making an aggregate of over 6,000 acres. Plants are now kept much longer in nurseries to lessen the cost of weeding, which is an expensive operation, and annually attended to after the plants are set out in the fields.

There has been some question as to the time to bring the plantings to maturity, but four years is now the accepted period, while plants retained in the nurseries, as above stated, will mature in three years. There is but little to add to former reports on this enterprise, which has passed out of the experimental stage and will not probably present any new features of interest until exports of fibre begin, which will be, on a moderate scale, in 1892, then developing annually into proportions of increasing importance.

The value of the fibre, like that of other products, will, of course, be subject to market conditions from time to time, but, in the natural order of things, it will ever be the main export and, regarding all the surrounding circumstances, it is difficult to see how it can fail to pay present investors handsomely and to be, to them, a source of income less liable to fluctuations than is the case with most commercial adventures. The time is now approaching when the machines for separating the fibre from the leaf will acquire practical importance ; of those now in use none seem to meet all the requirements. Some of them clean the fibre well ; but the process is wasteful, and the correction of this defect is the object to be accomplished. With so great an interest at stake we must suppose inventive genius will be found equal to the occasion. Professor Edison has directed his attention to the matter of

decortication and he hopes he has found an effective method which avoids waste. The treatment is by a solution of crude petroleum, and this Government are now in communication with the Professor. If the results meet our requirements, a most important end will be attained, which will have the further advantage of enabling small cultivators to dress their own leaves instead of being compelled to sell them at a loss to a large neighbouring planter, who is able to procure a machine.

The process being enterprised by Professor Edison embraces other and most valuable interests in this colony. Many thousands of tons of pine-apple leaves are now annually left to waste. The fibre commands a high price, from 60*l.* to 80*l.* a ton, for use in fine textiles. The small quantity now produced comes from China, where it is roughly and expensively prepared for want of a machine sufficiently delicate to extract the tender fibre without injury. The proposed mode would seem to meet this difficulty, as all strain or friction is avoided, and the result of pending inquiries is looked for with great interest. The immediate effect of successful experiment would be to turn a wasted product into an article of much value, adding substantially to the returns of pine-apple cultivation and this process may be applied to the growing crop. It is understood that the same solution may be used many times, and, if present hopes are realised, the petroleum will be admitted free of the duty now imposed.

CCII.—ARGEL LEAVES.

(*Solenostemma Argel*, Hayne.)

Alexandrian Senna of commerce has commonly been adulterated with Argel leaves yielded by *Solenostemma Argel*, Hayne, a native of Upper Egypt, Nubia, and the northern parts of Arabia. It is figured in Bentley and Trimen's Medicinal Plants (tab. 175). It appears to have formerly been the custom "to mix two parts of Argel leaves with eight "of senna leaflets, and the mixture thus formed constituted commercial "Alexandrian Senna."

Argel leaves may be known from senna leaflets by their paler colour, more leathery texture, less conspicuous veins, and by being equal-sided at their base. It appears from the experiments of Christison "that "they possess little or no purgative effect, but cause sickness, griping, "and other unpleasant symptoms." They were principally collected by the Arabs in the valleys of the desert to the east and south of Assouan. They were thence sent to Cairo to be mixed with true senna leaflets.

No authentic specimen of Argel leaves existing in the Kew Museum, an application was made to the Foreign Office to procure a sample. In the correspondence given below it will be noticed that during the last few years, since the trade with the Soudan has been closed, Argel leaves have not been brought into Egypt.

ROYAL GARDENS, KEW, to FOREIGN OFFICE.

SIR, Royal Gardens, Kew, 31st October 1890.

I AM desired by Mr. Thiselton Dyer to inform you that the leaves of a plant, native of Upper Egypt and Nubia, known as *Solenostemma Argel*, are said to be used for adulterating commercial senna leaves at Alexandria.

In the Museums of Economic Botany at Kew an attempt is made to furnish as complete a series as possible of every economic substance derived from the vegetable kingdom. In certain cases it is sought also to supplement these by exhibiting substances used for purposes of adulteration. In this way such substances may be the more readily detected.

In this particular instance the use of the leaves of *Solenostemma* as an adulterant of commercial senna may be decidedly injurious, as the plant belongs to the Asclepiadacæ, a natural order containing plants which, as a rule, are of a poisonous character. In nearly all there is an acrid juice of a drastic character.

As no other means are available to this establishment, Mr. Thiselton Dyer would esteem it a favour if the Secretary of State would invite the assistance of Her Majesty's Agent and Consul-General at Cairo to procure a small quantity, about a pound in weight, of the dried leaves of *Solenostemma* for the use of the Royal Gardens.

I am, &c.

Sir Villiers Lister, K.C.M.G. (Signed) D. Morris.

Sir E. Baring to Foreign Office.

My Lord, Cairo, January 22nd, 1891.

On receipt of your Lordship's Despatch, No. 43, Commercial, of the 4th November last, I asked Mr. Wallace, the Director of the Agricultural College in Egypt, to endeavour to procure for me some of the dried leaves of the *Solenostemma Argel*, in compliance with the desire expressed by the Director of Kew Gardens.

I have now been informed by Mr. Wallace that he has ascertained that the leaves of this plant are not now to be found in Egypt.

They were, he says, formerly brought in from Nubia, before the events of the last few years closed the trade with the Soudan, but they are not brought in now. Mr. Wallace has promised to do his best to get some of the leaves from Nubia, but before he can do so there may be some difficulty and delay.

I have, &c.

The Marquis of Salisbury, K.G., &c. &c. &c. (Signed) E. Baring.

Foreign Office to Royal Gardens, Kew.

Sir, Foreign Office, 16th June 1891.

With reference to your letter of the 31st October last, I am directed by the Secretary of State for Foreign Affairs to transmit to you, to be laid before the Director of the Royal Gardens, Kew, the accompanying specimens of *Solenostemma* leaves which Sir E. Baring has, at last, succeeded in obtaining from Nubia.

I am, &c.

The Assistant Director, Kew Gardens. (Signed) Jas. Ferguson.

CCIII.—PARAGUAY JABORANDI.

(*Pilocarpus pennatifolius*, Lem.)

In 1881 there was received through the Foreign Office from Mr. E. H. Egerton, C.B., then Her Majesty's Chargé d'Affaires at Buenos Ayres, a supply of leaves of "Jaborandi," an alkaloid-producing plant found in Paraguay. The Jaborandi usually met with in commerce comes from Brazil. It is especially found in the neighbourhood of Pernambuco, growing in forest clearings, on the slopes of the hills. The leaves and young shoots are used for their sialagogue and diaphoretic properties. The active principal of Jaborandi is an alkaloid to which the name of Pilocarpine has been given.

Professor Oliver, F.R.S., the late keeper of the Herbarium and Library of the Royal Gardens examined the Jaborandi received from Mr. Egerton, and made the following report upon its botanical identity :—

"The Jaborandi received from Mr. Egerton seems identical with specimens in the Kew Herbarium from Paraguay, collected by Gilbert and Balansa, referred to *Pilocarpus pennatifolius*, Lemaire.

"The Herbarium also contains leafy specimens (without inflorescence) of the Pernambuco Jaborandi, which probably belong to an allied but different species, judging from the indentation and the form of the base of the leaflets.

"*P. pennatifolius* appears to have been introduced from St. Paulo, but Baillon has identified with the species fragments gathered in Corrientes by Bonpland.

"I doubt if *P. selloanus*, Engl. be distinct."

The Paraguay Jaborandi appears to be less effective than the Brazilian. The particular characteristics of the former are carefully worked out in the following correspondence. It has not been found possible to carry the matter further, and the information acquired is placed on record for the use of those interested in the subject.

FOREIGN OFFICE to ROYAL GARDENS, KEW.

SIR, Foreign Office, 1 September 1881.

I AM directed by Earl Granville to transmit to you herewith, for your information, an extract from a despatch from Her Majesty's Chargé d'Affaires at Buenos Ayres respecting certain vegetable products of Paraguay.

I am, &c.

Sir J. Hooker, K.C.S.I., &c. &c. &c. (Signed) T. V. LISTER.

EXTRACT from Mr. EGERTON'S No. 5 COMMERCIAL of July 31, 1881.

IN answer to my numerous inquiries respecting medicinal dye and fibrous plants, I learnt that one of the most remarkable of the former is a plant which grows in great quantities in Paraguay, the virtues of which first became known in Europe about six or seven years ago, called Jaborandi, from which a product called Pilocarpine is made, which is unequalled for its effect as a sudorific. There are said to be two kinds of this plant in Paraguay, one of which only is efficient.

There is a plant, which is extremely common, called the yambayu, which the Indians consider—and is used at Buenos Ayres—as a cure

for asthma; but, from what I learn, its virtues in this respect have been exaggerated, and it is not likely to become, like Jaborandi, an article of commerce.

Mr. Villiers Lister presents his compliments to Sir Joseph Hooker and begs to state that he is directed by Earl Granville to forward the accompanying extract from a letter from Her Majesty's Chargé d'Affaires at Buenos Ayres respecting the "Jaborandi," an alkaloid producing plant found in Paraguay. The leaves of the plant mentioned by Mr. Egerton are sent in a separate packet, and Mr. Lister is to request that Sir Joseph Hooker will distribute samples thereof to the College of Physicians or to any other institution to whom the plant might be of use or interest.

Foreign Office,
September 5, 1881.

Extract from a Letter from Mr. Egerton.

Buenos Ayres, July 30, 1881.

From Pernambuco I understand that the leaves of a shrub called "Jaborandi" are now exported in certain quantity to Germany, where a valuable alkaloid is extracted from them that fetches a very high price in the drug market.

Now in Paraguay this plant (leaves of which I send herewith) exists in such enormous quantities that, even should its richness in alkaloid be less than that from Pernambuco, its cost would be relatively very much less. Indeed it has no value in Paraguay.

The chief virtue as a drug of this "Jaborandi" known in Paraguay is that a decoction from its leaves is the strongest sudorific known.

Royal Gardens, Kew, to Foreign Office.

Sir, Royal Gardens, Kew, September 8, 1881.

I am desired by Sir Joseph Hooker to acknowledge the receipt of your letters of September 1st and 5th relating to Mr. G. H. Egerton's reports on certain vegetable productions of Paraguay.

The sample of Jaborandi from this source, and the information regarding it, is of great interest. The drug, although a recent introduction to pharmacy, is one which has attracted much attention. Its commercial source, as Mr. Egerton has stated, is Pernambuco.

Professor Oliver, the Keeper of the Herbarium here, who has looked into the matter, reports that, though the Paraguay and Pernambuco plants are extremely closely allied, it is possible that they are not absolutely identical. The medicinal properties are, probably, however, similar. A portion of Mr. Egerton's sample has been preserved for the Museum of the Royal Gardens; the remainder has been divided between the Pharmaceutical Society, the Professor of Medicine at University College (Dr. Sydney Ringer), and Dr. Michael Foster, the Prælector of Physiology, Trinity College, Cambridge. I

will take care to furnish you with any reports which reach us as to its pharmaceutical value.

It would be interesting to have dried specimens in flower of the Paraguayan Ipecacuanha, and also a sample of the drug.

I am, &c.

T. V. Lister, Esq., Foreign Office. (Signed) W. T. Thiselton Dyer.

Prof. Sydney Ringer to Royal Gardens, Kew.

15, Cavendish Place, Cavendish Square, W.,
September 24.

My dear Sir,

I enclose the report on Paraguayan Jaborandi, and, with best regards, remain,

Yours, &c.
(Signed) Sydney Ringer.

Report on Paraguayan Jaborandi.

This specimen is undoubtedly true Jaborandi, but it is far inferior to the Pernambuco Jaborandi, for its physiological action is much less, and it yields much less alkaloid, and apparently this alkaloid is much weaker as a sweater than the alkaloid obtained from the Pernambuco leaves.

Mr. A. W. Gerrard, F.C.S., made the pharmaceutical examination, and I append his report.

"Three estimations were made of the alkaloid in the leaves, and this, converted into nitrate, gave a mean of ·12 per cent. This yield is very small compared with that of other Jaborandis. The nitrate of the alkaloid formed a moist semi-crystalline mass, slightly deliquescent, thus differing from the Pilocarpine of ordinary Jaborandi.

"The leaves are comparatively rich in essential oil. This at present has no commercial value."

The yield of nitrate of Pilocarpine from good commercial Jaborandi leaves is ·33, hence the Paraguayan specimen only contains one-third of that contained in the ordinary commercial Jaborandi. Pilocarpine of commerce contains at least two alkaloids, and only one of these is diaphoretic; and our physiological investigation suggests that the alkaloid derived from the Paraguayan specimen contains but little of the diaphoretic alkaloid.

Mr. S. Stonham, resident house physician at University College, made the physiological investigation. He experimented on himself, as well as on other persons. He employed an infusion of the leaves, the liquid extract, and the alkaloid.

The Paraguayan specimen, like ordinary Jaborandi, causes sweating, salivation, and lachrymation, the salivation in every instance being in excess of the sweating.

Mr. Stonham made three observations with an infusion, using 90, 90, and 120 grains of the leaf respectively; two observations with liquid extract, using ʒij and ʒiij respectively; and four observations with the alkaloid, using $\frac{1}{3}$, $\frac{1}{3}$, $\frac{1}{2}$ of a grain, and 1 grain respectively. The alkaloid was administered hypodermically; 60 to 90 grains of the

infused commercial leaf and one-third to one-half of a grain of commercial Pilocarpine produce copious sweating and salivation, lasting from four to six hours, whilst much larger doses of Paraguayan Jaborandi excites far less sweating and salivation, both of which results ceased within an hour.

To a man we gave hypodermically $\frac{1}{3}$ grain of commercial Pilocarpine, and in three minutes he sweated profusely. To the same man on another day we gave $\frac{1}{2}$ grain of Paraguayan Pilocarpine, and this excited only slight perspiration and slight salivation.

This last experiment shows that in the same dose the alkaloid from commercial Jaborandi is much more active than the alkaloid from Paraguayan Jaborandi. This is probably due to the fact that the methods employed extract all the alkaloids. Now Jaborandi yields at least two alkaloids. Probably the non-sweating alkaloid predominates in Paraguayan Jaborandi.

Mr. Gerrard, who probably knows more of the pharmacy of Jaborandi than any other man, tells me that he finds the black leaves yield most alkaloid, but these Paraguayan leaves are thin. Possibly another specimen of thicker leaves might be more efficacious. I certainly suggest that another specimen should be sent over, and I would further suggest that the whole plant of different year's growth should be tested.

SYDNEY RINGER, M.D.

Dr. MICHAEL FOSTER to ROYAL GARDENS, KEW.

The leaves were entrusted, for the preparation of the purified alkaloid, to Messrs. Brady and Martin, of Newcastle-on-Tyne. Those gentlemen succeeded in obtaining a small quantity of alkaloid only, and this they were unable to present in a crystalline form, so that no exact statement can be made as to the quantity of alkaloid present in a given quantity ofleaves.

The physiological investigation of this alkaloid was entrusted to Mr. J. N. Langley, M.A. of Trinity College. He found that the alkaloid had an action similar to that of Pilocarpine, but differing in some respects. Like Pilocarpine, it gives rise to increased secretion, of saliva, perspiration, &c., and like Pilocarpine, in larger doses it stops secretion; but in this alkaloid the arrest of secretion comes on earlier, *i.e.*, with smaller doses, than is the case with Pilocarpine. Hence, as a drug to promote secretion of saliva, perspiration, &c., the present alkaloid is inferior to Pilocarpine.

But there are reasons for believing that in Jaborandi and in Pilocarpine, as at present prepared, there are two alkaloids, one stimulating secretion and one stopping secretion. If this is the case, and if means are discovered for isolating them, then the value of the leaves under discussion would depend simply on the quantity of the stimulating substance present in them.

Besides this the alkaloid present in these leaves has not so injurious an effect on the heart and vascular system as has Pilocarpine.

The general conclusion at which Mr. Langley and myself have arrived at is, that if the alkaloid were (even approximatively) isolated in the country itself where the leaves are gathered it might be worked profitably even at the present time, though it would not pay to export the leaves to be worked up in this country on account of the smaller quantity which they contain. If pharmaceutical chemists succeed in isolating a stimulating substance and the method prove capable of

being employed on a large scale, then these leaves would become very valuable.

Hence, even if it is decided to do nothing with them at present, they should not be wholly lost sight of.

M. Foster.

Trinity College, Cambridge,
October 7th, 1882.

CCIV.—JOURNEY IN NYASSALAND.

The following account of a journey made on the frontier of the British Protectorate of Nyassaland by Mr. John Buchanan, C.M.G., Acting Consul at Nyassa, who has already made botanical collections in the Shiré Highlands, contains references to plants and native industries of an interesting character. The district traversed was along the river Ruo, a tributary of the Shiré river, in a north-easterly direction towards the southern extremity of Lake Nyassa.

Foreign Office to Royal Gardens, Kew.

Sir, Foreign Office, April 6th, 1891.

I am directed by the Marquis of Salisbury to transmit to you herewith, for your information, copy of a despatch from Mr. Buchanan, the Acting British Consul at Nyassa, giving an account of a journey taken by him from Chilomo to Milange.

I am, &c.

The Director, (Signed) P. W. Currie.
Royal Gardens, Kew.

Mr. Buchanan to the Foreign Office.

My Lord, Chilomo, December 10th, 1890.

With reference to my despatch to your Lordship, No. 48, of the present series, I have now the honour to enclose an account of my journey, which for the greater part lay along the frontier of the British Protectorate of Nyassaland.

The geographical feature most worthy of notice is my discovery of the Zoa Falls, which are situated on the Ruo, about 25 miles inland from Chilomo. The falls are from 150 to 200 yards in breadth and 200 feet in depth.

I trust this account, though imperfect, may be of interest to your Lordship at the present time.

I have, &c.

(Signed) John Buchanan,
Her Majesty's Principal Secretary of State for Foreign Affairs. Her Majesty's Acting Consul.

Report of a Journey taken along the Frontier of the British Protectorate of Nyassaland.

Starting from Chilomo our path lay along the right bank of the Ruo for the first 10 miles across an almost perfectly level plain, passing through Chief Mkengwa's principal village Pamlambi, and thence to Doa, Nchacha, Chipolopolo and Ntengera. Owing to the recent Portuguese troubles several villages had been deserted, while on the other hand new villages were being constructed by natives who had crossed from the other side.

A mile inland from the Shiré there commences an extensive belt of Borassus palm, which, varying in breadth from one to nine miles, extends from the Ruo to near Nkati, a distance, including a few broken tracts, of between 35 and 40 miles. Nowhere is the result of the Portuguese invasion more apparent than in the number of those graceful productions of the vegetable kingdom that now nudely stand as if protesting against the barbarous treatment they received at the hands of those ruthless intruders, who beheaded them for their life's blood. Giant Baobabs and tall "Njale" trees stud the plain, and the umbrageous Kigelia is ever present. As one journeys on he comes suddenly upon patches of lawn closely shaven by the incisors of the wary antelope, defined it may be by a fringe of dwarf palm supported by a combination of other trees and shrubs, and the ubiquitous mimosa, which, though unmerciful to the feet of the unshod traveller, not only when in flower entrances the vision by presenting a solid semi-globe of golden blossom, but diffuses around a fragrance such as only prodigally beneficent nature may indulge in.

Several miles of the plain are densely wooded with the more common types of African forest, Acacia, Bauhinia, Terminalia, Pterocarpus, Tamarindus, &c. ; and at the foot of the hills, the forest, if not primeval is certainly virgin. There is here to be had an abundant supply of firewood for river work, but so improvident are the natives, and so destructive their methods of agriculture in deforesting a district, that care will have to be exercised in order to maintain a supply of this article so necessary for river steamers. A very considerable amount of Sesamum is grown by the natives in addition to other crops of cereals along the banks of the Ruo, and it is hoped the acreage will this year be largely increased.

The river abounds in fish, and it is no exaggeration to say, that in some places the water is literally black with shoals of yambo, golokolo, machenga, micheni, msuluwa, mambuli, makambali, and others, all more or less eaten by the natives, and some of which are welcome adjuncts to the white man's cuisine. Men and boys sit for hours at a time in some secluded spot on the river's bank, patiently plying the "gentle art," while others less mindful of sport resort to traps and weirs.

At Mtengera the first of the rocks known as Chichiri are visible. For some distance below this point navigation is difficult, but above it it is impossible. A light draught steamer may ascend the Ruo at all times for several miles, and for several months during the wet season as far as Chipolopolo's, about eight miles, while boats may ply as far as Mtengera nine to 10 miles, during the whole 12 months : but above the rocks no craft can be of use.

At this point the hills commence, and the path still following the course of the river crosses many undulations before reaching the spot where Mlolo from the left bank has chosen to establish himself. The

country between Mtengera and Mlolo's, a distance of about five miles, is poor. The various undulations are covered with trees of small growth, the soil is thin and shingly. Near to and about Mlolo's it is different, there being less shingle and more earth.

Chief Mlolo I found awaiting my arrival. Ever since the first visit paid to him at Mongwe by the English he has proved staunchly friendly. Several times during the last 12 months he has requested British protection, and the British flag, which requests, owing to his being on the left bank of the Ruo, could not be entertained. Not to be done, however, and rather than submit to Portuguese sovereignty, he left his country, and crossed into the British Protectorate. This step meant to himself and his people a severe sacrifice, as they had to leave their well-stocked storehouses to Portuguese troops, and live for months on what food they could scrape together from among their Manganja friends.

Mlolo, being a hospitably disposed man, deeply lamented the poverty of his position, in that he had not the means of treating me as he would wish to have done.

I presented him with the British flag, greatly to his delight. His principal village, which consisted of a hundred or more huts, was still in the embryo stage, and before he could enter thoroughly upon the work of the field, he had to present an offering to the spirits of his ancestors. This took place on my return journey, about three weeks after. I was present and witnessed the ceremony. The headmen and elders of the village assembled outside the chief's hut. Two young damsels were seated on the ground, each holding a small basket in her lap. The chief himself officiated as priest. He proceeded to transfer the contents of a flat sieve filled with flour into the small baskets, letting the flour fall gently through his fingers, the while enumerating his wants and desires in a kind of chant, while a principal headman at intervals called out "Wopa, wopa," which was intended for a strong seconding of Mlolo's statements, and was in turn approved of by the elders, who unanimously clapped their hands in full assent. The next part of the ceremony was to adjourn to the banks of the Ruo, where, under a shady tree, an altar had been prepared. This consisted of a few withes stuck into the ground in a circular form, making an enclosure 18 inches diameter by about three feet high, a grass roof for which had been prepared, and lay at hand. The two young damsels were seated as before, the ground within the enclosure was carpeted with a yard of blue cotton cloth, a small earthenware pot was pierced at the bottom and placed in the centre. Mlolo now took the flour in handfuls from each girl alternately, and carefully placing it within the altar by the side of the pot, again enumerated his wants, and beseeched the spirits of his ancestors to look favourably upon him and his people in their new home. The burden of his prayer was that he might be blessed with abundance of ivory and good crops, and as a set off against these requests he brought prominently forward some of his good deeds, chief of which was his loyalty to and preference for the English, as evidenced by his having left his country and some of his kindred rather than be cut off from British connexion.

The flour having been duly deposited in the orthodox way, a vessel of native beer was next brought forward, and as each ladleful was decanted into the receptacle within the altar, he repeated his prayer as before, while the old man at his hand responded "wopa, wopa," and the elders of the assembly repeatedly clapped their hands in a solemn amen. The pot within the altar was now filled, notwithstanding its being perforated, and as the precious liquid streamed from within the sacred precincts, several young men, who had not tasted their beverage since crossing the

frontier, voted libations out of place at such a trying time. The priest having notified that they had done their duty to their ancestral spirits reserved a toothful of the beer, which led to a rather unseemly altercation between the assistants, notably,—he whose function it was to call "wopa," and whose throat decidedly needed moistening. The ceremony being over, a general clapping of hands followed, as a grand amen to the whole proceedings; the grass roof was placed over the altar; the calabash used in decanting the beer was hung on a branch of the tree overhead and the company retired. Garden and field operations were soon undertaken in right earnest, and on my revisiting Mlolo's 10 weeks later, many acres of forest had been cleared and planted.

Mlolo's villages extend for several miles below and above that in which he resides, which is situated partly on a promontory jutting into the Ruo, and partly on a knoll lying in the bosom of a crescent-shaped ridge. One tall solitary Borassus palm stands as a landmark of former inhabitants long since gone.

Passing beyond Mlolo's the path follows closely the course of the river. Here and there it crosses belts of meadow, now under an umbrageous tree whose grateful shade invites the traveller to rest, then emerges to the waters' edge, and so on for several miles till it enters upon very rough and stony ground trying alike to tender feet and shoeleather.

At this part of the river its bed is one mass of rocks and boulders, the geological formation of which is beautifully evident. For several hundred yards the appearance of these rocks is as if a shower of snow had fallen on ground already frozen, and had been blown into tiny wreaths of a wavy pattern, this appearance being due to the various strata having a sinuous wavy form, and the rocks themselves polished by the wear and tear of ages.

At Nakale, nine miles above Mlolo's, there is a small village of that chief's people eking out a precarious subsistence. Our friends on the other bank made strenuous efforts to persuade the Nakale people that they had egregiously blundered in leaving Portuguese for British territory, only they would not see it. We found here an intact specimen of the bark canoe used in crossing the river.

Two miles further on you get the first glimpse of the Zoa Falls, another half hour, during which you ascend several hundred feet, and you stand on a level with them, and already begin to feel and to breathe the bracing atmosphere of the mountains. Fifteen minutes more takes you to the village of Nhataombere, which is presided over by a swarthy dame, who placed her best residence at the disposal of the stranger.

For years past I had knownthat the Ruo abounded in miniature falls and cataracts, but until I passed it was not known to Europeans that this charming river, among the sombre recesses of the hills, took a giant leap of 200 feet into a foaming abyss whose depth I had no means of estimating, and which the river itself had formed during bygone ages. I estimate the breadth of the river bed at this point at about 200 yards, while from bank to bank across the face of the fall, the breadth is much more.

The falls of Zoa are about 25 miles inland from the mouth of the Ruo, and at an elevation of between 1,400 and 1,600 feet. The general outline of the fall is that of a horse shoe. Near to the left bank is a chasm some 60 yards long by 30 yards broad and 200 feet in depth to the water level. From this chasm to the right bank the wall is less or more terraced. Above the chasm on the left bank there stands a huge mass of rock, from behind which and down whose face during the wet season pours a gigantic cataract. At the time of my first visit the water from various channels collected into one main stream which thundered

down the chasm foaming and furiating between its walls, sending heavenwards clouds of vapour, and in emerging from its confinement dashes itself out into a breadth of 150 yards and continues its angry course impinging on rocks and boulders till reaching Nakale, where it composes itself into dark blue lakelets, tempting indeed to the heated traveller. During the rainy season while the river is full, the water is spread over the full extent of the river bed, and must indeed be a magnificent sight. The face of the falls abounds in several large and many small "pot holes" from 18 inches to 10 feet diameter, and from one to 10 feet deep. I was not fortunate enough to see the water at its work of forming these holes, but the stones lying at the bottom of them, some in the rough, others kidney shaped, others almost round, are conclusive evidence of the water's action.

An Alga common to many of the rocky river beds in Nyassa-land had taken possession of every hole and cranny where it was possible to exist, and liberally carpeted the face of the fall with living green. On the left bank several species of aloes were in bloom, and among the rocks there existed various kinds of succulent plants enjoying the moist atmosphere of the spot. Both banks are well wooded down to the water's edge.

The country around Zoa is composed of hills and ridges, from the top of some of which an extensive view to the east may be obtained. The village of Nhataombere is situated on a level spot between two of these ridges that abruptly terminate at the Ruo, thus ending the series of hills which, commencing at the Murchison Cataracts, follow the course of the Shiré, gradually diverging inland to a distance of 10 miles at the Ruo, forming a wall averaging from 2,000 to 3,000 feet high, probably 70 miles long, and fronting the plateau on which Blantyre, Mandala, and surrounding districts are situated. Among these hills are many hamlets of industrious Manganja, who are great workers in iron, which, in the shape of agricultural implements, finds a ready sale.

For eight miles beyond Nhataombere the road lies through very broken country, till reaching the Zuchila, which, cut up into many channels, forms a river 150 to 200 yards at its confluence with the Ruo. The Zuchila forms the main drain for a very extensive tract of country. Rising on the north-east face of Milanji, it makes a wide detour out into the plain, and passes through much marshy land, collecting supplies from many streams and rivulets, some of which take their rise within a few miles of Blantyre. The country beyond the Zuchila is rather hilly for the first few miles, until reaching the Milanji plain. The road from the Zuchila to Milanji ran through a succession of Wa-nyassa villages, many of which were of quite recent origin, the inhabitants having only lately crossed from the left bank. I was much pleased with the attitude displayed by these Wa-nyassa people. As we reached each hamlet we were presented by the headmen with fowls and flour. The people were delighted with the idea of having been placed under British protection, as it augured for them peace and liberty. The Wa-nyassa, who now inhabit the country from the Zuchila along the right bank of the Ruo to its most easterly affluents in the Milanji Mountains, are the original possessors of the land. They are a peace-loving but weak people, who have been harassed and robbed by the intruding Wa-yao, until now comparatively few remain in distinctly separate districts. Chipoka, recently deceased, who had his principal village on the Mloza, was the representative chief of the district. He was a quiet, well-dispositioned man, who seldom or never took the aggressive. His own hut was situated near to a clump of patriarchal monarchs of the forest,

beneath whose sheltering branches, enclosed by a reed fence, are several altars raised to the ancestral spirits of the Wa-nyassa. In times of trial and difficulty the old man often found his way within the sacred enclosure, and might be seen as if in earnest, close communion with those inhabitants of the supernatural world, or making some little offering or performing acts which, if pleasing to the spirits, they would make manifest to Chipoka by assisting him in some of the many forms in keeping with the orthodox African's faith.

The whole district abounds in iron. Every hamlet has its smithy, and to every group of hamlets there is a melting furnace, where the ore is reduced to malleable form. Hoes and axes were in demand, and early morning saw the blacksmith hard at work, while the hammerman, who, body bent, and legs apart, raised a roughly square stone high over his head, and brought it down with herculean force upon the glowing metal, signallised to people afar off that the descendants of Ham are not wanting in the genius of Vulcan.

A villainous Yao chief, Chikumbo, who had previously helped himself liberally to Wa-nyassa territory, set his mind on subjecting the whole tribe to his rule at Chipoka's death. His tactics, however, have been meantime defeated, and it is hoped the Wanyassa may be enabled to live in peace and quietness in their own homes, under the special protection of Her Majesty's Government which they so ardently craved.

The country lying along the bank of the Ruo inhabited by these Wa-nyassa is slightly undulatory, and has a checkered appearance occasioned by large patches of grass land, divided by belts of moderately sized trees. The immediate banks of the Ruo support trees of beautiful trunk and form, and whose dark-green foliage, conspicuously high above the neighbouring forest, limn the course of the river. The prevailing colour of the soil of the district is red, and ferruginous. From the Shiré to Milanji, sorghum forms the staple crop. I passed through fields that had produced marvellously, and I measured sorghum stalks actually 20 feet in length. It would notwithstanding be a mistake to suppose that such fertility is to be found all over. *Cajanus indicus* is also cultivated extensively, and bears profusely, and here at least it almost merits the name of "bean tree." Judging from what I saw of the Milanji plain, it should be a wheat-bearing district, and as it is only slightly undulatory, and is well watered, it would be easily brought under cultivation. It may not be too imaginary to picture this plain before long the home of many happy families in the midst of fields of golden grain.

Having reached Milanji, which can be easily done in three days from Chilomo, I was heartily welcomed by the Rev. Robert Cleland, at whose mission station I stayed several days, and transacted certain consular business with chiefs in the neighbourhood. This devoted missionary had purchased a piece of land for mission purposes, built a house and started a school, and the Church of Scotland might fairly claim to have taken possession of Milanji in the name of Christianity. Chikumbo, however, proved so fickle and maintained his aggressive attitude towards the Wa-nyassa to such an extent as to render mission work almost hopeless; the more so as Mr. Cleland had planted his station between Chikumbo and the Wa-nyassa with the double intention of appeasing the former and ameliorating the position of the latter, to whom indeed he rendered much assistance. Pending the advent of a more peaceful state of matters Mr. Cleland and his coadjutor, Dr. Scott, removed to a neighbouring chief under whose friendly ægis they hoped to prosecute their labours, but malarial fever had already told upon

Mr. Cleland's constitution, and a few weeks after my visit he was numbered among those who have laid down their lives for the regeneration of Africa, deeply regretted by all who knew him.

Having completed what political work I had to do I moved north-east to Mount Machemba, and Mr. Cleland accompanied me. The road lay along the base of Milanji. This grand mountain merits description by a better pen than mine. Based upon a plain, 2,000 feet above sea level it rises in lofty grandeur to a height of 8,000 or 9,000 feet, and extends eastwards for a distance of 20 miles, being separated by a narrow path from Mount Cheza, a continuation of whose well-wooded ridges extend to the south of Lake Shirwa, forming the south-easterly ledge of the Shirwa basin. The north face of Milanji, Chambe, confronts you with 6,000 feet of living rock, the south and easterly faces are less perpendicular, and more broken. The home of Manga is a distinct feature of this part of the mountains. Situated at the south-east corner, and slightly apart from the main body of Milanji, it rises to a height of 6,000 or 7,000 feet, and seems to possess an influence in attracting passing rain clouds as the climate in its vicinity is more moist, and actual showers more frequent than anywhere else. The north-east face is well wooded, and in the numerous ravines which proceed from the serrated apex of the mountain may be seen the stately boles of a species of pine tree, which so far as I know is still undescribed. At no remote date all the slopes of Milanje must have been densely wooded. Isolated patches of virgin forest still remain on the eastern faces, but the devastating axe and fire of the natives have worked sad havoc. The district on the whole is well watered. Every ridge has its burn, and large streams are frequent. On the top of the mountain, within a limited area, four rivers, the Lichenya, Likubula, Zuchila, and Ruo, take their rise, the three former discharging into the latter, and all of which are formidable and difficult to cross during the rainy season. The soil is fertile, that at the north-east corner about Chipoka's particularly so. All along the base of the mountains are large patches of wet grass land, capable of producing vast supplies of rice, which at present is a limited article of cultivation. Maize and sorghum are the staple crops. Bananas grow luxuriously. At Chipoka's there are a few orange trees which produce an excellent quality of fruit.

Milanji is peopled chiefly by Wa-yao and Wa-nyassa, the latter being wedged in about the upper affluents of the Ruo between Chikumbo and Metapwiri. The Wa-yao of these parts are well known as inveterate slavers, who still traffic in this nefarious trade.

From Milanji we passed to Mount Machemba, a long day's journey. Machemba is an unpretentious mountain situated on the Shirwa plain about 15 miles south-west of that lake. The Palombe River, which rises in the Cheza range and flows northwards eight miles or so west of Machemba, defines the south-western limits of the Shirwa basin, the Zuchila being the territorial boundary between the respective districts. A great part of the journey was over an uninteresting plain, monotonously level, and already badly off for water. This plain stretches northwards for many miles, and during the wet season is partly under water. During the dry season water supply is a serious question. In the immediate neighbourhood of Machemba it is obtained from wells, and is brackish. The vegetation of the plain is mainly comprised of species of acacia, which seem to thrive anywhere. On the base of the mountain are a few baobabs which indicated connexion with Shirwa, *Erythrina* and genera common to the lowland were also represented,

while among the rocks monster euphorbias and yuccas hold possession, and predominate.

The Machemba district is peopled by Anguru, who have their head-quarters round the south and south-east corners of Lake Shirwa. The ruling chief is Nyeserera, who, save that his apparel was even more scant than that worn by his subjects, could not be distinguished from them. Though not distinguishable in dress, however, he proved himself a chief in kindliness of heart once he knew that our mission was peaceful. He was delighted, as were all his people, to receive the British flag, and in return for something I gave him presented me with a fat-tailed sheep such as I had never seen before. Nyeserera rules a numerous people who seem to enjoy life to the full. They came in crowds to see the strangers, my friend's donkey proving a great centre of attraction.

As the territory of Nyeserera reached the limits of the Nyassaland Protectorate in a north-easterly direction, the object of my journey was now accomplished, and I returned to Chilomo by a route which for the greater part lay through unexplored bush having no particular features worthy of description.

CCV.—AFRICAN OIL PALM.

(*Elæis guineensis*, Jacq.)

The *Kew Bulletin* for November 1889 (p. 259), contains some account of the Palm Oil industry of West Africa in connexion with the attempt made to introduce it into Borneo. This account may be supplemented by the fuller details extracted from the recently published Report of the Commission appointed in 1887 to consider the promotion of economic agriculture on the Gold Coast. This document contains a great deal of important information upon the principal staples of the Colony, and is understood to have been drawn up by the Vice-President, Mr. W. F. Hutchinson, "a gentleman of local connexion and practical experience," who has himself established and worked an agricultural farm in the neighbourhood of Cape Coast.

Of all the products of the Gold Coast the *Elæis guineensis* is undoubtedly the most important to the native. The fruit supplies him with a favourite food and two important articles of commerce; with the leaf-stalks he builds his house and barn and thatches them with its leaves, and from the stem he extracts a pleasant and (sometimes) intoxicating drink. The tree prefers a moist soil, flourishing in the warm, damp valleys, where it grows in extensive forests. It has never been made the object of systematic cultivation, but, as far as can be ascertained, it begins to bear in its fourth or fifth year, increasing till its fifteenth, and continues to bear at least 60 years. It produces from four to seven bunches of nuts every year. As the "fatness" of the nuts (*i.e.*, the amount of oil contained in the fibre) differs greatly according to soil, the quantity of oil varies from three gallons per year in a moist soil to one gallon in dry. These nuts have a fibrous covering which contains the famous palm oil. Three varieties of the tree are distinguished, having orange, red, and black nuts respectively, the first giving the finest oil but small kernels, the others less oil but larger nuts. When the bunches of nuts are ripe they are cut and thrown into a hole in the ground till a sufficient quantity is collected to be made into oil.

During this time the nuts appear to undergo a small amount of fermentation, and the produce is "hard" oil, the fresh nuts giving "soft" oil which fetches a better price in the European markets. The quality of the "hard" oil is also deteriorated by the dirt which becomes mixed with the nuts while stored, to separate which no care is taken. When a sufficient quantity has been collected the nuts are boiled till the fibre is softened; they are then heaped up in stone troughs specially prepared for the purpose, and beaten with sticks till the fibre is loose. The heap of nuts is then covered with plantain leaves and left for 12 hours, during which time great heat is developed and a quantity of oil runs off. The nuts are then washed in hot water and the fibre separated and squeezed by hand. The oil is then boiled to separate it from the water taken up in the washing.

This process is defective at every stage. To produce the finest quality and the largest quantity of oil the nuts should be treated when just ripe and fresh gathered from the tree. They should not be allowed to ferment, which darkens the colour of the oil and causes it to harden. The separation of the fibre by beating and hand squeezing is slow and gives very imperfect results, and should be replaced by machinery in the first stage and hydraulic presses in the second. At present quite 25 per cent. of the oil is lost, first by imperfect separation of the fibre, a large quantity of which is left adherent to the nuts, and second by want of power in the squeezing, which fails to extract the whole of the oil. Finally, the last boiling further darkens the oil, as palm oil changes colour according to temperature. * * * * *

Pure fresh palm oil has an agreeable smell (it has been described as resembling that of plum cake), and is of a bright orange colour; but the oil of commerce, owing to faults of manufacture, has a stink absolutely indescribable, and every shade of colour between golden yellow and black. In the Western Province the quality is further deteriorated by adulteration. At Salt Pond a peculiar fine red earth is used for mixing by the middlemen. In the Chama district the oil is mixed with over ripe plantains and sour kanki. Accra may be considered the dividing line of the two sorts, the oil made in that district and to the eastward being soft, that made to the westward being hard. The soft oils are in general purer than the hard; these being less able to incorporate foreign substances, the adulteration is almost confined to the mixture of water. * * * * * * *

To show the effect of adulteration nothing more is necessary than to compare the position of Lagos oil (which is the purest known) with that of Gold Coast oil on the European market. When Lagos oil sells for 22*l.* 10*s.* per ton, Accra oil (which includes Addah and Quittah sorts) fetches 19*l.* 10*s.*, and Salt Pond (including Winnebah, Appam, and Chama sorts) 18*l.* only, or 20 per cent. less than Lagos sorts. No doubt some of the superiority of Lagos oil is inherent in the article, but having in view the amount of adulteration in the oil from the Gold Coast, it is not unreasonable to expect that the production of a purer oil and the adoption of the Lagos "cold" process of manufacture (as distinguished from the Gold Coast "hot" process) would approximate prices. * * * * * It is impossible to pass from this subject without referring to the fluctuations in the price of palm oil which have occurred during the last few years. * * * * *

It is the difficulty of transport that keeps the price on the Gold Coast at such a height as renders the present state of the markets in Europe unprofitable to the exporter, although the grower can produce it at a cost which would enable him to sell it with profit at 3*d.* to 4*d.* per gallon. Allowing 300 gallons to the ton, the cost to the exporter would

be 3*l*. 15*s*. to 5*l*. per ton, which, after paying for caskage, shipping, &c., and allowing 1*l*. per ton for transport from the plantation to the beach, would enable him to place it on the European market at 13*l*. per ton. In view of the increasing use of other fats, displacing palm oil in many directions, the inhabitants of the Colony have to face the probability of the price of palm oil touching 15*l*. to 14*l*. per ton, and have the right to call upon their Government to perform its obvious duty by putting the roads in such a condition as to enable them to transport their produce at a reasonable cost, and to prevent their staple produce being driven from the market to the ruin of their trade. After the manufacture of the oil the nuts are still valuable, as they contain the well-known palm kernels. For every ton of palm oil there should be 2½ tons of clean palm kernels, and yet we find that the exports of this article are much below those of the oil. The direct loss to the Colony is enormous, and arises from the same causes as diminish the export of oil. Machines have been invented by Gunnell and others for the purpose of rapidly breaking the nuts, but they can never come into general use until it is possible to move large weights in carts along roads adapted to the purpose, as will be evident when it is considered that under present conditions four men are required to carry, on their heads, sufficient nuts (2 cwts.) to produce 56 lbs. of kernels, the value of which varies from 1*s*. 9*d*. to 2*s*. 3*d*. Owing to this cause 100,000*l*. worth of this one article are annually wasted. The palm kernels are exported to Europe, where the oil is extracted, but this might be done on the Coast if it were possible to put oil mills on the plantations or to convey nuts cheaply to central mills, and would probably be found more remunerative than the exportation of the kernels. The average yield of the kernels being 30 per cent. of their weight in oil, the utilisation of the whole estimated crop would produce 8,700 tons of oil per annum, which at the price of cocoa-nut oil (which it closely resembles) would be worth to the Colony over 175,000*l*. To this must be added the value of the cake after the expression of the oil. The brown or black oil made by the process now in use in the country is not worth exporting, as it can be only slightly bleached, and is therefore useless for soap-making.